ABSTRACT OF THE DISCLOSURE

A fail-safe apparatus for controlling fluid flow through a series arrangement of first and second solenoid-controlled valves is provided. The fail-safe apparatus includes fail-safe circuitry for controlling the operation of the first and second solenoid-controlled valves between unactuated and actuated states. Based on a given duty cycle, the fail-safe circuitry selects, actuates, deactuates, and/or maintains in the actuated or unactuated state one or both of the first and second solenoid-controlled valves.

To facilitate such control, the fail-safe circuitry may include a switch operable to couple an input voltage across the first solenoid-controlled valve to cause a first current to flow therein. The fail-safe circuitry may also include an energy-transfer device coupled between the first and second solenoid-controlled valves. Depending of the duty cycle, the energy-transfer device is operable to store a potential therein and/or use the stored potential to assist in controlling the first and second solenoid-controlled valves.

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